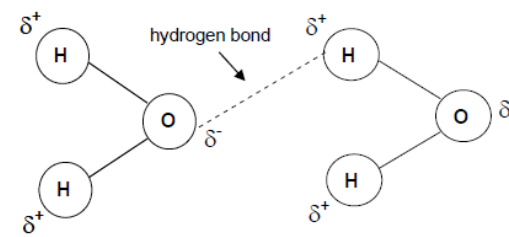


1 (a)	<p>1 hydrogen bond represented as, horizontal / vertical, dashed line between O on one molecule and H on the adjacent molecule ;</p> <p>2 hydrogen / H, bond label (on any drawn bond between 2 molecules) ;</p> <p>3 (delta positive) δ^+ on each drawn H <u>and</u> (delta negative) (2) δ^- on each drawn O ;</p>		 <p>1 DO NOT CREDIT if >1 H bond is drawn between the same two molecules</p> <p>3 if both molecules drawn, δ^+ and δ^- on all atoms. ACCEPT d (lower case) for δ</p>
(b)	<p><i>ice floats</i></p> <p>P1 (ice less dense because) molecules spread out ;</p> <p>P2 molecules form, crystal structure / lattice / AW ;</p> <p>P3 ice forms insulating layer / clearly described ;</p> <p>P4 water (below ice), does not freeze / still liquid / remains water / kept at higher temperature ;</p> <p>S1 organisms do not freeze ;</p> <p>S2 animals / organisms, can still, swim / move ;</p> <p>S3 allows, currents / nutrients, to circulate ;</p> <p><i>solubility</i></p> <p>P5 ions / named ion, polar / charged ;</p> <p>P6 ions / named ion, attracted to / bind to / interact with, water ;</p> <p>S4 (named) organisms / plants / animals, uptake / AW, minerals / named mineral / nutrients ;</p> <p>S5 correct use of named, mineral / nutrient, in organism ;</p> <p><i>temperature stability</i></p> <p>P7 many / stable, (hydrogen) bonds between molecules ;</p> <p>P8 at lot of energy to, force apart molecules / break bonds ;</p> <p>P9 high (specific) <u>heat capacity</u> ;</p> <p>S6 temperature does not change much / small variation in temperature ;</p> <p>S7 effect of temperature on , enzymes / metabolic rate ;</p> <p>S8 gases remain soluble ;</p> <p>H <i>Award once in any section</i> hydrogen bonds ;</p>	3	<p>P3 e.g. acts as a barrier to the cold</p> <p>S1 DO NOT ACCEPT die (because 'survival' stated in stem)</p> <p>S4 ACCEPT obtain / enters / goes in / gets</p> <p>S5 needs to be more specific than 'for growth / metabolism' suitable examples include but are not limited to: nitrates for amino acids / protein / (named) nucleic acid / phosphate for ATP / phospholipids / plasma membrane / magnesium for chlorophyll etc</p> <p>P7 Many hydrogen bonds between molecules = 2 marks (gets P7 and H)</p> <p>P8 ACCEPT heat as alternative to energy</p> <p>P9 DO NOT CREDIT latent heat capacity</p> <p>S6 could refer to organisms or surrounding water ACCEPT stays cool in summer / stays warm in winter DO NOT CREDIT constant alone</p> <p>S7 ACCEPT any reference to temperature affecting enzyme activity / metabolic rate</p> <p>DO NOT CREDIT if in incorrect context (e.g. they are strong bonds)</p>
	<p>QWC - Award if you see a P mark and an S mark within the same section ;</p>	7 max	<p>1 Look for the S mark first, then award QWC if there is a P mark in the same section in the mark scheme</p>
(c)	<p>hydrolysis / hydrolytic ;</p> <p>hydrophilic ;</p>	2	<p>ACCEPT phonetic spelling throughout</p> <p>IGNORE head</p>
	Total	13	

(a)	(i)	L ; M ; J ;	3	If 2 nd letter given, no mark																																	
(a)	(ii)	1 peptide bond ; 2 between, amine / J group (of one amino acid) and carboxyl / L group (of another) ; 3 H (from amine group) combines with OH (from carboxyl group) ; 4 condensation reaction OR water, lost / eliminated / produced / created / AW ; 5 covalent ;	3 max	CREDIT answers from clearly drawn diagrams with bonds labelled 1 ACCEPT peptide link																																	
(b)		1 some R groups, attract / repel ; 2 disulfide, bridges / bond ; 3 between, cysteine / SH / S (atoms) ; 4 hydrogen / H, bonds ; 5 ionic bonds between, oppositely charged / + and -, R groups ; 6 hydrophilic R groups, on outside of molecule / in contact with water (molecules) ; 7 hydrophobic R groups, on inside of molecule / shielded from water (molecules) ;	4 max	4 DO NOT CREDIT in context of secondary structure																																	
(c)	(i)	<table><thead><tr><th></th><th>glycogen</th><th>collagen</th></tr></thead><tbody><tr><td>1</td><td>carbohydrate / polysaccharide</td><td>protein / polypeptide</td></tr><tr><td>2</td><td>(alpha) glucose (units)</td><td>amino acid (units)</td></tr><tr><td>3</td><td>identical units</td><td>different amino acid units</td></tr><tr><td>4</td><td>glycosidic, bonds / links</td><td>peptide, bonds / links</td></tr><tr><td>5</td><td>branched</td><td>unbranched / linear</td></tr><tr><td>6</td><td>non-helical</td><td>helical</td></tr><tr><td>7</td><td>one chain (per molecule)</td><td>three chains (per molecule)</td></tr><tr><td>8</td><td>no cross links</td><td>cross links (between chains)</td></tr><tr><td>9</td><td>contains C H O</td><td>contains C H O N</td></tr><tr><td></td><td></td><td></td></tr></tbody></table>		glycogen	collagen	1	carbohydrate / polysaccharide	protein / polypeptide	2	(alpha) glucose (units)	amino acid (units)	3	identical units	different amino acid units	4	glycosidic, bonds / links	peptide, bonds / links	5	branched	unbranched / linear	6	non-helical	helical	7	one chain (per molecule)	three chains (per molecule)	8	no cross links	cross links (between chains)	9	contains C H O	contains C H O N				3 max	AWARD 1 mark per correct row Comparative statements must be made in a row 2 DO NOT CREDIT beta 5 ALLOW straight 7 DO NOT CREDIT strands 9 IGNORE S (for collagen)
	glycogen	collagen																																			
1	carbohydrate / polysaccharide	protein / polypeptide																																			
2	(alpha) glucose (units)	amino acid (units)																																			
3	identical units	different amino acid units																																			
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9	contains C H O	contains C H O N																																			
(c)	(ii)	(high tensile) strength / strong ; does not stretch / is not elastic ; insoluble ; flexible ;	2 max	Mark the 1 st answer on each numbered line IGNORE fibrous / tough																																	
Total			15																																		

3

(a)	(i)	<table><tr><td>reagent</td><td>observation</td><td>molecule</td><td>present or absent</td></tr><tr><td>ethanol and water</td><td>white emulsion</td><td>lipid</td><td>present</td></tr><tr><td>Benedict's solution</td><td>brick-red precipitate</td><td>reducing sugar / lactose / glucose / galactose / monosaccharides</td><td>present ;</td></tr><tr><td>biuret I and II</td><td>lilac colour</td><td>protein / named milk protein</td><td>present ;</td></tr><tr><td>iodine solution</td><td>yellow / brown</td><td>starch / amylose</td><td>absent ;</td></tr></table>	reagent	observation	molecule	present or absent	ethanol and water	white emulsion	lipid	present	Benedict's solution	brick-red precipitate	reducing sugar / lactose / glucose / galactose / monosaccharides	present ;	biuret I and II	lilac colour	protein / named milk protein	present ;	iodine solution	yellow / brown	starch / amylose	absent ;	3	<p>One mark per correct row. IGNORE 'yes', 'no' and ticks and crosses DO NOT CREDIT if anything incorrect is written in any box in the molecule column. e.g. 'starch or cellulose' = 0 mark</p> <p>ACCEPT maltose DO NOT CREDIT sucrose</p> <p>ACCEPT casein / lactoglobulin / lactalbumin / polypeptide</p> <p>IGNORE amylopectin</p>
reagent	observation	molecule	present or absent																					
ethanol and water	white emulsion	lipid	present																					
Benedict's solution	brick-red precipitate	reducing sugar / lactose / glucose / galactose / monosaccharides	present ;																					
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iodine solution	yellow / brown	starch / amylose	absent ;																					
(a)	(ii)	milk is already, cloudy / an emulsion / white / AW ;	1	ACCEPT idea of difficulty in detecting change because of the appearance of milk																				
(a)	(iii)	<p>(one) glycerol / glyceride ; 3 fatty acids ;</p> <p>ester bond (between glycerol and fatty acid) ;</p>	3	<p>ACCEPT marking points from clearly labelled diagram but DO NOT CREDIT if contradicted in text. IGNORE individual atoms on diagram and look for correct position of labels MAX 2 if phosphate group included (as could be confused with phospholipid)</p> <p>ACCEPT on diagram if 3 shown and at least one labelled ACCEPT triglycerides are esters</p>																				
(b)		<p>1 (thermal) insulation ; 2 energy, store / source / release ;</p> <p>3 protection ; 4 membranes / phospholipid bilayer / control entry and exit into cells ; 5 (steroid) hormones / named steroid hormone ; 6 buoyancy ; 7 waterproofing ; 8 source of water (from respiration) ; 9 (electrical insulation) in myelin / around neurones / around axons / around dendrons ; 10 aid, absorption / storage / production, of, fat soluble / A / D / E / K, vitamins ;</p>	3	<p>MARK THE FIRST RESPONSE ON EACH NUMBERED LINE</p> <p>1 ALLOW 'warmth' 2 CREDIT answers that refer to the idea of lipid as a respiratory substrate but DO NOT CREDIT 'for respiration' unqualified IGNORE 'fat contains energy' without further qualification DO NOT CREDIT refs to producing energy or to quick energy release ACCEPT 'provides energy'</p> <p>4 CREDIT ref to cholesterol in membranes</p> <p>9 CREDIT nerve fibres / saltatory conduction IGNORE nerves</p>																				
(c)	(i)	<p>saturated ; (fatty acids have) no / fewer, double bonds ; solid at room temperature ;</p>	1 max	<p>Assume answers refer to animal fats unless otherwise stated ACCEPT reverse argument IGNORE ref to fats and oils (as stated in question)</p> <p>ACCEPT 'fatty acids are not kinked' ACCEPT reasonable temperature quoted</p>																				
(c)	(ii)	<p>1 (death rate for) men greater (at any concentration) / AW ; 2 (death rates) rise with increasing cholesterol / AW ; 3 death rate for men, initially / AW, falls ; 4 steep(er) / AW, rise (in, males / both) at higher cholesterol levels ;</p> <p>5 comparative figures with unit for (blood) cholesterol to support any of the above points ;</p>	3 max	<p>1 ACCEPT ora</p> <p>2 ACCEPT 'positive correlation' (between death and cholesterol) 3 ACCEPT 4.8 or below as 'initially'. 4 Answers must refer to latter part of graph only (5.7 or above). ACCEPT difference (between sexes) greater at high concentration</p> <p>5 There are 3 ways of getting this mark:</p> <ul style="list-style-type: none">values for both sexes at single concentrationtwo values for single sex at two concentrationssubtraction / calculation, that shows comparison <p>IGNORE terms like 'about' See table for acceptable examples of x and y values – if intermediate cholesterol values are used, refer to the graph for the data</p>																				

blood cholesterol (mmol dm ⁻³)	deaths per 10 000	
	women	men
3.6	13.2 - 14.1	31.2 - 32.1
4.3	15.0 - 15.9	26.0 - 26.9
4.8	14.0 - 14.9	24.0 - 24.9
5.2	15.1 - 16.0	24.6 - 25.5
5.7	17.4 - 18.3	25.8 - 26.7
6.2	17.8 - 18.7	33.2 - 34.1
6.7	23.5 - 24.3	31.3 - 32.2
7.3	22.0 - 22.9	44.1 - 45.0
8.2	31.7 - 32.6	59.5 - 60.4

Must include (blood) cholesterol units

Any figure within a particular range is acceptable

(c)	(iii)		Mark first two in list
	1 coronary heart disease / CHD / cardio-vascular diseases / heart attack / cardiac arrest / myocardial infarction / MI / angina ;		1 DO NOT CREDIT heart disease alone or 'conary' ACCEPT hypertension / high blood pressure
	2 atherosclerosis / atheroma ;		2 DO NOT CREDIT arteriosclerosis
	3 stroke ;		
	4 Type 2 diabetes ;		
		2	
	Total	16	

4	(a)	<p>1 <u>sequence</u> / <u>chain</u>, of amino acids ;</p> <p>2 (amino acids) joined by peptide bonds ;</p> <p><i>secondary</i></p> <p>S1 alpha / α, helix ;</p> <p>S2 <u>small regions of</u>, beta / β, pleated sheet / fold ;</p> <p>S3 hydrogen / H, bonds ;</p> <p><i>tertiary</i></p> <p>T1 secondary structure / helix / polypeptide chain, undergoes further, coiling / folding ;</p> <p>T2 3 bonds / interactions from: disulfide / ionic / hydrogen / hydrophobic or hydrophilic ;</p> <p>T3 hydrophilic <u>R groups</u> on outside (of molecule) / hydrophobic <u>R groups</u> on inside (of molecule) ;</p> <p><i>quaternary</i></p> <p>Q1 4, polypeptides / subunits ;</p> <p>Q2 2, alpha / α, chains and 2, beta / β, chains ;</p> <p>Q3 1 haem (group) per polypeptide / 4 haems (per molecule) ;</p> <p>3 prosthetic group (is) haem, (which) contains Fe^{2+} ;</p>		<p>CREDIT marking points from a clearly labelled diagram</p> <p>1 IGNORE polypeptide</p> <p>S3 Must be in context of secondary structure</p> <p>T1 ACCEPT polypeptide chain folds further</p> <p>T2 IGNORE if clearly in context of secondary or quaternary structures</p> <p>T2 H bond must be in context of tertiary structure</p> <p>'contains 2 α and 2 β polypeptides' = 2 marks (Q1 and Q2)</p> <p>Q3 IGNORE protein in ref to 1 haem (group) per polypeptide</p> <p>3 ACCEPT iron ion / Fe^{+} / Fe^{3+}</p> <p>3 DO NOT CREDIT iron / Fe unqualified</p>
	(b)	<p>QWC - correct refs to secondary, tertiary and quaternary structure :</p> <p>(collagen has)</p> <p>1 amino acid, <u>chain</u> / <u>sequence</u> ;</p> <p>2 peptide bonds ;</p> <p>3 helical / helix ;</p> <p>4 3 bonds / interactions from: disulfide / ionic / hydrogen / hydrophobic or hydrophilic ;</p> <p>5 quaternary structure ;</p> <p>6 more than one polypeptide / subunit ;</p>	<p>6 max</p> <p>1</p> <p>4 max</p>	<p>1 S mark and 1 T mark and 1 Q mark Assume answer refers to collagen unless stated If the answer mentions only collagen, assume that the candidate thinks any features mentioned also apply to haemoglobin.</p> <p>1 IGNORE polypeptide</p> <p>1 IGNORE repeating units</p> <p>3 DO NOT CREDIT if candidate refers to collagen having an α helix</p> <p>5 IGNORE primary /secondary / tertiary</p> <p>6 ACCEPT polypeptides but DO NOT CREDIT 3 polypeptides if number in haemoglobin not specified</p>
		Total	11	

5

(a)	(i)	D ; A ; F ;	3	Mark the first answer for each letter. If an additional answer is given then = 0 mark																		
(a)	(ii)	B ; E ; F ; F ;	4	Mark the first answer for each letter If an additional answer is given then = 0 marks																		
(b)		1 insoluble ; 2 does not , change / affect , water potential / Ψ , of cell ; 3 can be , broken down / hydrolysed / built up , quickly / easily ; 4 lots of branches for <u>enzymes</u> to attach ; 5 compact ; 6 (therefore) high energy content for mass / energy dense / AW ;	3 max	2 ACCEPT osmotically inactive / AW 3 Answers must contain the idea of ease or speed of breakdown IGNORE broken up Answers must imply density, e.g. 'it is compact and so stores a lot of energy' = 2 marks																		
(c)	(i)	α /alpha , glucose ;	1	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks ACCEPT 'a'																		
(c)	(ii)	1 respiratory substrate / used for respiration ; 2 source of / releases / provides, energy ; 3 formation of ATP ; 4 conversion into named compound ;	1 max	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks DO NOT CREDIT any answer that clearly states that glucose is energy, makes energy, produces energy or creates energy 1 ACCEPT used in respiration ACCEPT 'releases energy for respiration' 2 IGNORE used for energy 4 e.g. starch / cellulose / polysaccharide / disaccharide / glycogen / protein / lipid / sucrose / maltose / fructose / fat																		
(c)	(iii)	D ;	1	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks ACCEPT F IGNORE triglyceride / fat / lipid / haemoglobin																		
(d)		<table><tr><th>glycogen</th><th>cellulose</th></tr><tr><td><i>no hydrogen bonding</i></td><td><i>hydrogen bonding</i></td></tr><tr><td>α / alpha , glucose</td><td>β / beta , glucose</td></tr><tr><td>1,4 and 1,6-glycosidic bonds or 1,6-glycosidic bonds present</td><td>1,4-glycosidic bonds (only) or 1,6-glycosidic bonds not present</td></tr><tr><td>branched</td><td>not branched / linear / straight</td></tr><tr><td>no , fibres / fibrils</td><td>fibres / fibrils</td></tr><tr><td>granules</td><td>no granules</td></tr><tr><td>all glucose units in same orientation</td><td>adjacent glucose units in opposite orientation</td></tr></table>	glycogen	cellulose	<i>no hydrogen bonding</i>	<i>hydrogen bonding</i>	α / alpha , glucose	β / beta , glucose	1,4 and 1,6-glycosidic bonds or 1,6-glycosidic bonds present	1,4-glycosidic bonds (only) or 1,6-glycosidic bonds not present	branched	not branched / linear / straight	no , fibres / fibrils	fibres / fibrils	granules	no granules	all glucose units in same orientation	adjacent glucose units in opposite orientation	3 max	Comparative statements must be made on the same line Award 1 mark for each correct side by side comparison. ALLOW two valid comparisons in the same pair of boxes, e.g. <table><tr><td>α-glucose in a branched chain</td><td>β-glucose in a straight chain</td></tr></table> = 2 marks ACCEPT 'a' and 'b' ACCEPT helical / spiral / coiled vs linear / straight DO NOT CREDIT α -helix	α -glucose in a branched chain	β -glucose in a straight chain
glycogen	cellulose																					
<i>no hydrogen bonding</i>	<i>hydrogen bonding</i>																					
α / alpha , glucose	β / beta , glucose																					
1,4 and 1,6-glycosidic bonds or 1,6-glycosidic bonds present	1,4-glycosidic bonds (only) or 1,6-glycosidic bonds not present																					
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α -glucose in a branched chain	β -glucose in a straight chain																					
Total			[16]																			